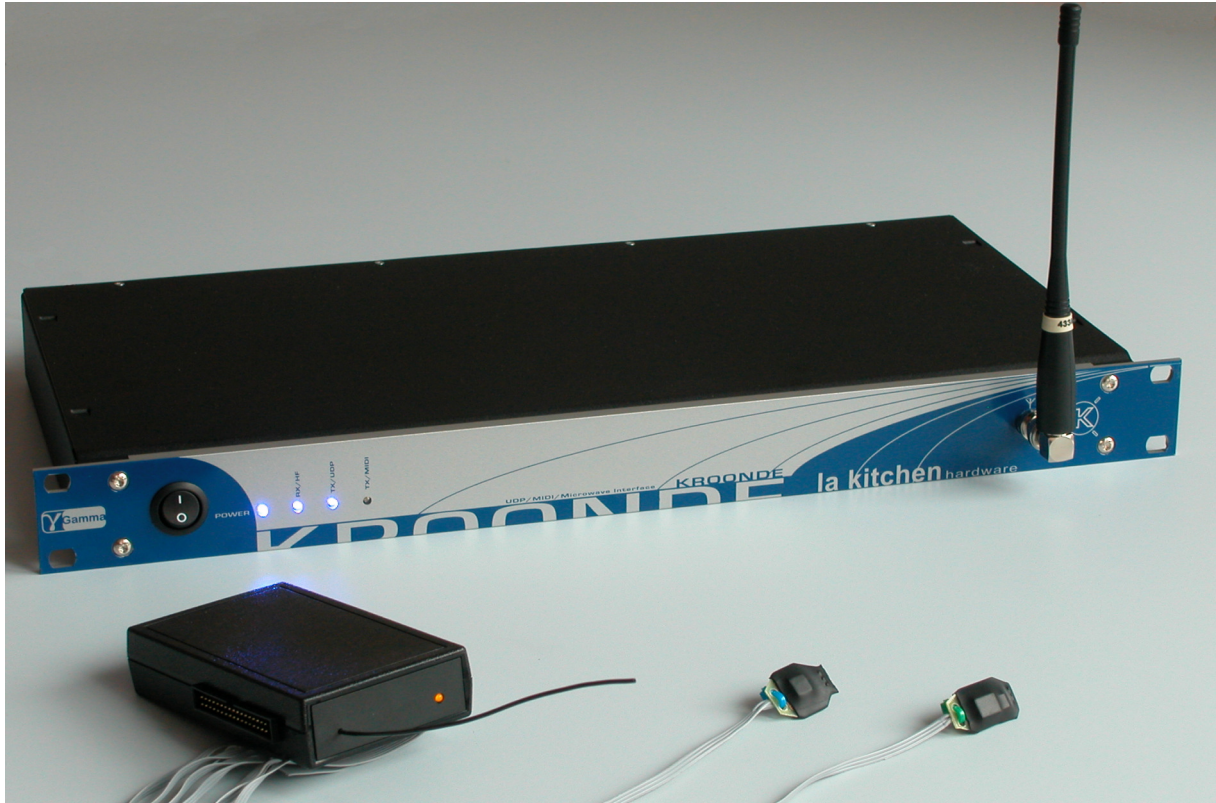


Kroonde

Gamma



16-sensor wireless UDP interface



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I. Introduction

The Kroonde Gamma is a wireless sensor interface designed for real-time applications.

A small transmitter pack (4.5" x 2.7" x 1") accepts up to 16 analog sensors and transmits their values to a receiver/interface. The sensors are connected to the wireless transmission box by two 8-channel connectors. The transmitter pack has a 9V-battery life of about 10 hours (depending on sensors used). It weighs less than 5.3 oz, battery included.

The effective radio transmission range varies from 100ft (in a difficult environment) to 300ft (outdoors), operating at 914Mhz.

The receiver/interface (1U) receives information from the transmitter pack and outputs the sensor data via a high-bandwidth connection (Ethernet (10MB/s), UDP) to a computer, with a precision of **10 bits** per sensor. The Kroonde can also send the sensor data via MIDI.

II. Performance

When only one connector is plugged in, only the first 8 sensors are polled, which reduces latency. The wireless link itself has a latency of about 1ms. In the United States, one transmission frequency is available (914MHz); in Europe, two are available (433MHz & 869MHz).

Refresh rate at 433 MHz (Europe):

UDP (10-bit precision)

8 sensor: 5ms
16 sensor: 9ms

MIDI (7-bit precision)

8 sensors: 7ms
16 sensors: 12ms

Refresh rate at 869 MHz (Europe) or 914 MHz (USA) (10-bit precision):

UDP

8 sensors: 9ms
16 sensors: 15ms

III. Sensors

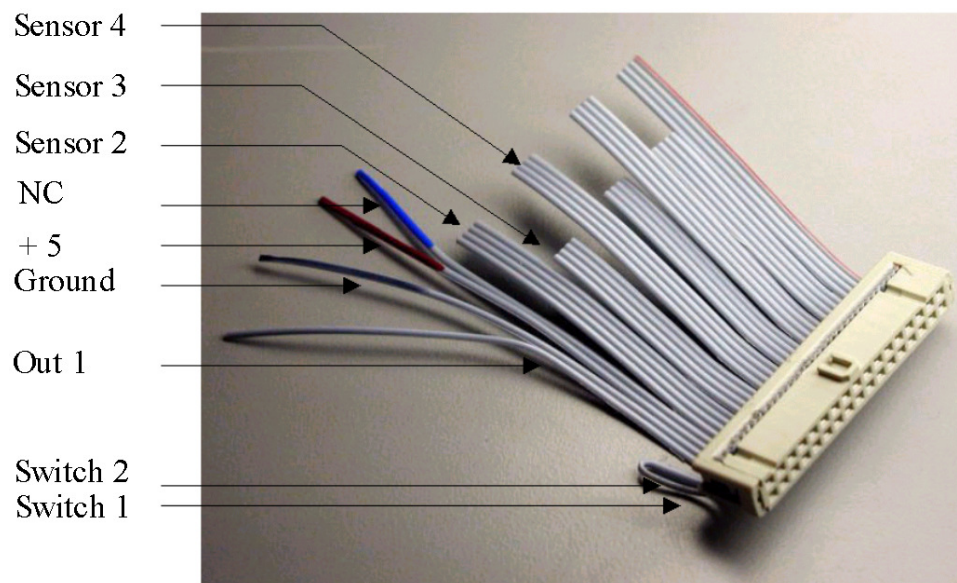
The sensors are connected in 8 groups of 4 wires to a female HE10 34-pin connector. The 4 conductors are analog sensor output, ground, +5v DC, and unused. The analog

voltages (0-5V) of the sensors' outputs are converted into digital words (10 bits) before wireless transmission.

Any sensor that outputs 0 to 5 Volts analog is compatible with the Kroonde. This includes pressure, flexion, acceleration, rotation speed, magnetic field, and light.

Interfacing

The connectors are arranged as follows:



- **Pins 1 and 2:** must be connected, so that inserting the connector turns the transmitter pack on.

- **Pins 3 through 34, in groups of four pins :**

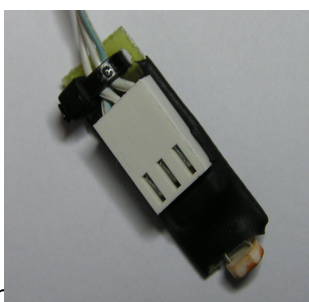
- **Output signal of sensor:** (analog 0-5v) sensor output. Transmitter pack input impedance is 20 Kohm. The voltage carried by this wire is digitized, then transmitted to the computer.

- **Ground :** of transmitter pack

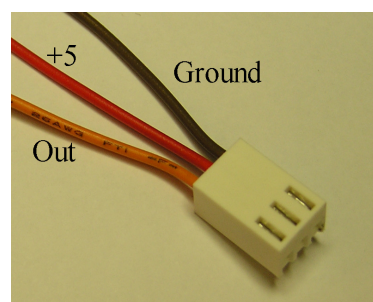
- **+5V:** from transmitter pack battery power supply to sensor.

- **Unused**

To change sensors, remove the cable clamp, unplug the sensor and connect another sensor.



Kroonde



version 1.6 – 1

IV. Transmitter Pack



The transmitter pack has two connectors, a status LED, and a flexible antenna. It's important not to cut the antenna.

The LED indicates whether the transmitter is on. The transmitter is on when a connector (with pins 1 and 2 shorted) is plugged into the first female 34-pin connector (the one located next to the LED). The sensors plugged into the first connector are numbered 1 to 8; those plugged into the second connector are numbered 9 to 16. When only connecting one set of sensors, the first 34-pin connector must be used.

On the back, the transmitter pack has 4 DIP switches. When switch 1 is ON, no inputs are polled. This is useful in avoiding transients when disconnecting the connector. The other DIP switches are reserved for future use.

U. Receiver/Interface



The receiver/interface is a 1U 19" rack, with a power switch, 4 LEDs and an antenna on the front panel.

On the rear there is a 9 V **AC** 500mA power supply connector, a MIDI out connector, an RJ45 jack for the Ethernet connection (10Mb/s), and 8 configuration DIP switches.

Lighted LEDs on the front panel indicate receiver/interface status (from left to right):

Power: Power is on.

RX: Receiving valid data from the transmitter pack.

UDP: Transmitting data via UDP.

MIDI: Transmitting data via MIDI.

UI. Output Protocols–Communication with the Computer

The Kroonde system communicates using three different protocols: OSC, FUDI and MIDI. All UDP communications are transmitted via socket 1234 to socket 5677 or 5678.

a) OSC

The OpenSoundControl Protocol is compatible with many different software environments including Max/MSP and pd.

Example patches for Max are included on the CD.

Protocol information for OSC is available at:

<http://cnmat.cmat.berkeley.edu/OSC/>

The latest version of the OSC objects for MAX can be found here:

<http://cnmat.cmat.berkeley.edu/OpenSoundControl/Max/>

OSC messages sent by the Kroonde are lists of sensor values. When using one set of 8 sensors, the Kroonde will send an 8 member list as an argument to the message "/kroonde". In this list, each integer element corresponds with the value of its respective sensor. When using two sets of 8 sensors, the transmitted list has 16 elements corresponding to the values of the 16 connected sensors.

More specifically, the sent OSC message is comprised of:

Bytes 1 - 8: "/kroonde" (in ASCII)

Bytes 9 -11: 0 (in binary)

(Bytes 1 - 11 are the OSC address pattern.)

Bytes 12 - 29: ",iiiiiiiiiiiiiii" (in ASCII)

Bytes 30 - 32: 0 (in binary)

(Bytes from 12 - 32 are the OSC type tag string)

Bytes 33 - 36: a 32-bit integer corresponding to the value of the first sensor. The last 10 bits are non-zero.

Bytes 37 - 40: identical, for the second sensor.

Bytes 41 - 44: . . .

b) FUDI (ASCII)

The binary output mode is compatible with the native pd "netreceive" object.

The messages sent by the Kroonde are of the format

Kroonde 132 234 343 (in ASCII) followed by character 10 (carriage return)

This example would be for three sensors with the values 132, 234, and 343, respectively.

c) MIDI

Controller messages are transmitted on MIDI channel 11 using controller numbers 0 - 7 or 0 - 15, depending on the number of sensors.

VII. UDP/MIDI Configuration

The receiver/interface has 8 configuration DIP switches on the back panel.

a) Configuration of transmission format

3 DIP switches configure the data output format(s).

Switch **1** activates the OSC protocol (for MAX/MSP).

Switch **2** activates the binary (FUDI) protocol (for pd).

Switch **3** activates MIDI transmission.

Simultaneous selection of several protocols is possible. The receiver/interface will transmit data correctly, although this may increase latency time and processor load.

The OSC protocol is selected at the factory.

b) IP Address Configuration

Switches 4 to 8 enable preset IP address configurations.

Changes in these switches take effect only when the receiver/transmitter is powered up.

Switches **4** and **5** are used for the Kroonde receiver/transmitter IP address:

| Switch 4 | Switch 5 | Kroonde IP |
|----------|----------|----------------|
| Off | Off | 192.168.0.10 |
| Off | On | 192.168.0.11 |
| On | Off | 192.168.255.10 |
| On | On | 192.168.255.11 |

Micro-switches **6** and **7** are used for the IP address of the UDP messages:

| Switch 6 | Switch 7 | Destination IP |
|----------|----------|-----------------|
| Off | Off | 255.255.255.255 |
| Off | On | 192.168.255.12 |
| On | Off | 192.168.255.13 |
| On | On | 192.168.0.12 |

Switch **8** determines the destination port of the messages:

The port is 5677 if the switch 8 is OFF; 5678 if the switch 8 is ON.

If the Kroonde transmitter/receiver is connected to only one computer, use a crossover cable.

If the Kroonde is connected to a local network, it will broadcast information to any computer connected to the network (regardless of its IP address) using an IP address of 255.255.255.255.

VIII. Installation

No installation is required for the Kroonde. The Kroonde will automatically transmit information to a target identified by its IP address.

For use with a Pure Data, the Kroonde is compatible with standard objects. For use with Max/MSP, Open Sound Control (OSC) from CNMAT must be installed. OSC is included on the CD.

The CD contains additional software, which enables visualisation of the on-line information. This software can be found in the "ethereal" folder of this CD.

Examples can also be found on the CD for both Pure Data and Max/MSP.

IX. DIP Switch Summary

- 1: OSC : On/Off
- 2: FUDI: On/Off
- 3: MIDI: On/Off
- 4: Local IP
- 5: Local IP
- 6: Remote IP
- 7: Remote IP
- 8: port: 5677/ 5678

X. La Kitchen Warranty

The Kroonde is guaranteed to be free of manufacturer's defects for one year.
Problems arising from abnormal use of this product are not guaranteed.
"Abnormal use" includes, but is not limited to, using input voltages greater than 9v.

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